its best performance. Preceding and following this period, the rate of the clock made abrupt changes."

Taking into consideration this somewhat erratic action on the part of the Dent, and the highly satisfactory way in which the Riefler has been performing, its arrival was timely.

Thanks are due to Professor TUCKER for aid in preparing this note.

R. F. SANFORD.

MT. HAMILTON, CAL., January 23, 1908.

THE ECLIPSE OF JANUARY 3, 1908.

Before this number of the *Publications* goes to press, I take pleasure in announcing that the total solar eclipse of January 3, 1908, was observed successfully by the Crocker Expedition from the Lick Observatory, University of California, and by the expedition of the Astrophysical Observatory, Smithsonian Institution. The united expeditions were landed on Flint Island on December 9th by the U. S. gunboat "Annapolis," in command of His Excellency C. B. T. MOORE, U. S. Navy, Governor of Tutuila. An observing site was selected in the midst of the cocoanut-trees, and preparations proceeded rapidly, notwithstanding the tropical heat and the multitudes of showers. Every arrangement for securing the observations during totality was completed in good time.

The forenoon of January 3d was alternately clear and cloudy, with the clearness much in excess. About ten minutes before the eclipse was total, clouds formed rapidly, until the sky was densely covered. Just as the time-keeper called from his chronometer, "Five minutes before totality," a drenching rain fell, and all seemed lost save honor. At the end of two or three minutes the rainfall began to decrease and the clouds in the east gave signs of breaking. Less than a minute before totality the slender crescent of the Sun showed faintly through the clouds, though a moderate rain was still falling. The rain and clouds grew rapidly lighter, and the last drops fell at two or three seconds after totality began. Immediately after the beginning of totality the corona was faintly visible through the thin clouds. These continued to disperse rapidly. During the second quarter of the total phase the clouds were extremely thin, and during the third and fourth quarters the sky was essentially clear.

About ten seconds before totality, the rain having nearly ceased, the order was given to the workman seated on top of the outer of the two towers supporting the forty-foot camera to remove the tarpaulin from over the lens. The order was executed promptly and the remnant of the Sun's crescent was seen by the observer inside of the camera just one second before totality. The signal "Go!" was called by the observer at the instant when the crescent disappeared. Such of the instruments as were still covered, awaiting the end of the rain,—for example, the larger cœlostat,—were uncovered within a few seconds, and the programme of observations was thenceforth carried through without a single slip. The twenty instruments, driven by seven clocks, and the twelve observers did their work to perfection. Two spectrographic exposures planned for the twelve seconds immediately preceding totality were necessarily omitted, and some of the sensitive plates were damaged by getting wet in the downpour. The remaining exposures were expected to give good results; and such proved to be the case when the plates were developed, during the following two nights. All of the instruments were in perfect focus and adjustment.

The observing station of the Smithsonian Institution was located on the beach, for scientific reasons, about one fourth of a mile northwest of the Lick Observatory station. Here the rain was lighter and the sky cleared earlier, so that Director ABBOTT had an essentially clear sky during the whole of totality. His interesting programme was carried out to his complete satisfaction.

Immediately following the drying of the photographic negatives, they were packed with care and sealed in tin for shipment to Mt. Hamilton. The expeditions re-embarked on the U. S. gunboat "Annapolis" on January 5th, arrived in Tahiti on the 7th, and in San Francisco on the 25th.

All the members of the expeditions were entirely free from illness at Flint Island.

We received extensive assistance from many people, which it will be a pleasure to acknowledge in our first formal publication on the subject.

An English expedition, in the charge of F. K. McCLEAN, Esq., was our near and agreeable neighbor from December 23d to January 3d. Mr. McCLEAN's party sailed from Flint

Island about three hours after the eclipse occurred, the plan being to develop the photographs in the dark-room on his vessel. We hope that his photographs have been found to be excellent.

W. W. CAMPBELL.

GOLDEN GATE, January 25, 1908.

SOME TESTS OF THE VERTICAL CŒLOSTAT OR "TOWER" TELESCOPE OF THE MT. WILSON SOLAR OBSERVATORY.

The vertical cœlostat telescope described in *Contributions from the Solar Observatory,* No. 14, was erected on Mt. Wilson last summer, and has been in regular use since October. A 17-inch cœlostat, with mirror 12 inches thick, is mounted at the summit of a steel tower 65 feet in height. From the cœlostat the sunlight is reflected to a second mirror of elliptical form, which sends it vertically downward to a 12-inch visual objective of 60 feet focal length. The solar image is formed in a house at the base of the tower, where it is studied with a spectrograph of 30 feet focal length, standing in an underground chamber 8½ feet in diameter and 30 feet deep. A spectroheliograph, also of 30 feet focal length, is being constructed for use with this telescope, but at present a simple attachment to the spectrograph adapts it for the monochromatic photography of the Sun.

The 5-foot spectroheliograph, when used with the Snow telescope, yields excellent photographs of the calcium, hydrogen, and iron flocculi. For narrower lines, however, higher dispersion is required, which involves longer exposures. With the Snow telescope these cannot be given, on account of the change of figure of the mirrors in sunlight. There is not only a marked lengthening of the focus, but also a decided effect of astigmatism, due to the distortion of the two plane mirrors. The mirrors of the vertical cœlostat telescope (commonly known as the "tower" telescope) were made very thick in the hope of reducing this distortion.

This plan has succeeded admirably, though there is reason to believe that even better results would have been obtained if somewhat thinner glass disks had been used for the mirrors. The change of focus is so slow that an exposure of half an hour or more can be given with the spectroheliograph. Moreover, no effects of astigmatism have been noticed until after the telescope has been in continuous use for several hours.